MATERNAL AND FETAL OUTCOME IN OBESITY COMPLICATING PREGNANCY

A Dissertation Submitted to

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BONAFIDE CERTIFICATE

This is to certify that the study entitled **"MATERNAL AND FETAL OUTCOME IN OBESITY COMPLICATING PREGNANCY"** is the bonafide work done by **Dr.E.Shanthi,** at the **Institute of Obstetrics and Gynecology, Government Hospital for Women and Children** attached to Madras Medical College, Chennai, from 2004-2007 under the guidance of

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CONTENTS

INTRODUCTION

INTRODUCTION

In general, pregnancy in women is considered unique, physiologically normal episode in women's life. However preexisting morbidity of the mother or fetus can complicate pregnancy and as well as those arising during pregnancy and intrapartum make it a high risk one. "A pregnancy is defined as high risk, when the probability of an adverse outcome for the mother or child is increased over the base line risk of that outcome among the general population by the presence of one or more ascertainable risk factors".[2a]

"One such pre-existing maternal morbidity that makes a pregnancy high risk is obesity".The magnitude of the obesity prevalence has been increasing in developed and developing nations, though in varying degrees. Also coming with the increase in obesity prevalence, inevitably, are the morbidities obesity promotes, including cardiovascular disease, diabetes, hypertension, stroke etc. It becomes a major issue when it affects the women of reproductive age group, as obesity makes a pregnancy high risk, by the increased incidence of gestational diabetes, preeclampsia, gestational hypertension, labour induction, increased cesarean rates, anesthetic complications, postoperative morbidity, prolonged hospital stay etc..

They are at increased risk of delivering large babies and NICU admission.

Although routine weighing of pregnant women is being carried out in most of the antenatal clinics, not much of importance is given to the weight of the women as such. In fact prenatal counseling plays a vital role in identifying women who are obese. Advice on weight reduction before embarking on pregnancy will go a long way in reducing the morbidity due to obesity in pregnancy.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

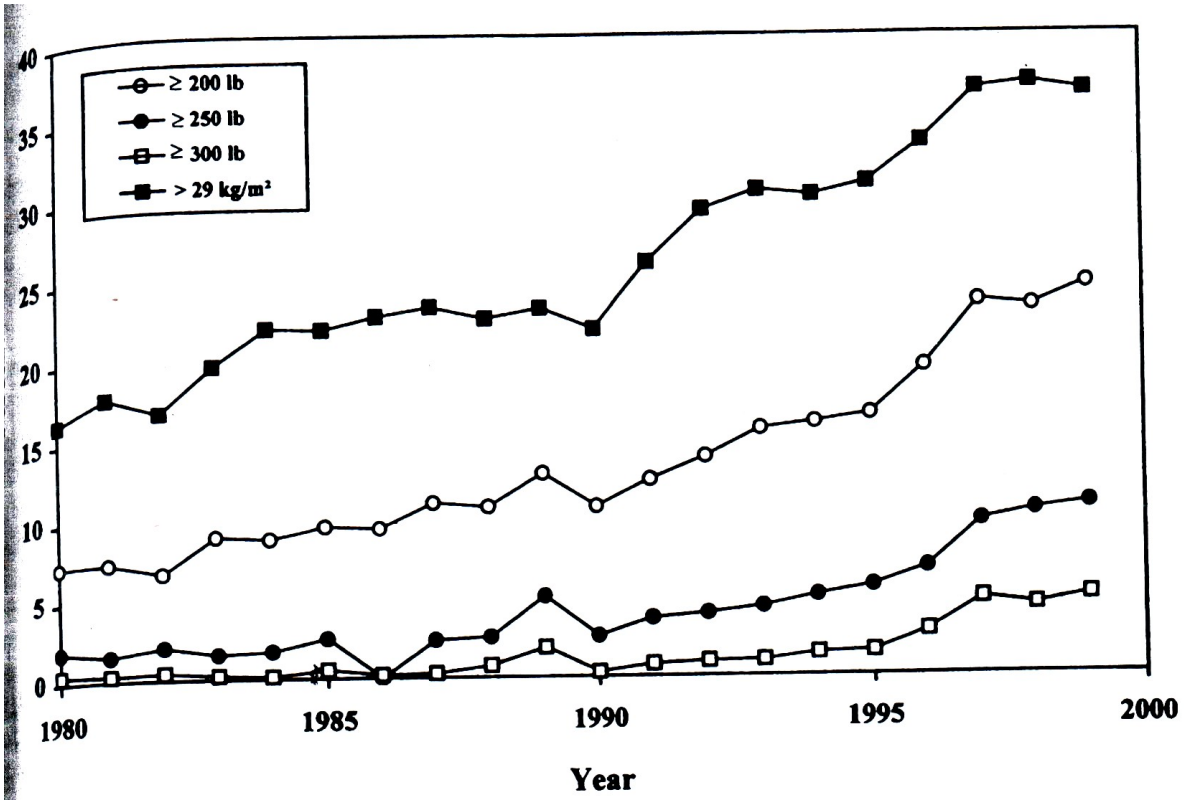
WORLD WIDE PREVALENCE

For a number of years, obesity has been termed epidemic, strictly defined, the word epidemic implies a temporary wide spread outbreak of greatly increased frequency. Therefore obesity more currently is endemic, a condition that is habitually present. Its prevalence is increasing world wide in both developed and developing countries.[3a]

In USA, from 1960- 1991 NHANES[59] documented an alarming increase among the adults over the past decades. More than 127 million American adults were over weight, 60 million were obese and 9 million were severely obese. Among the women in 1999 through 2000, 62% were overweight, 34% were obese, 6% were severely obese[7].

The incidence of obesity in pregnancy has increased in concordance with the prevalence in the general US population. The reported incidence of obesity during pregnancy varies between 6% and 28% depending on the obesity definition, year and characteristics of the study population[2,13,26,35,39,64,106].

Further more, Lu et al[26,106] examined the longitudinal trend of maternal obesity spanning from 1980-1999. They demonstrated that the incidence of obesity at the first prenatal visit increased from 7.3% to 24.4% in this 20 years time period.



Increasing prevalence of obesity during 20 years in pregnant women classified at the time of their first prenatal visit at the University of Alabama at Birmingham. (From Lu and Colleagues, 2001 with permission).

In a study by Glady[36] et al, the largest proportion of obese was among American Africans 22% followed by Latins 14%, Whites 8% and the Asians 4%.

In India a study conducted by Mohan et al[68] at Chennai in 2001 the prevalence in age group more than 20 years was 22.5% males and 31.8% in females.

The various studies conducted in India are shown below:

Prevalence of Obesity in India

Author	City Centre	Year	Age (yr)	Prevalence of Obesity(%)	
				Male	Female
Dhurandhar & Kulkarni[21]	Bombay	1992	31-50	10.7-53.1	-
Gopinath et al[38]	Delhi	1994	25-64	21.3	33.4
Zargar et al[107]	Kashmir	2000	>40	7.0	23.7
Gopalan[37]	Nutrition foundation of India	1998	-	32.2 16.2 7.0	50 30.3 27.8
District Nutrition Profiles Survey[54]	Food and Nutrition Board	1998	-	1.0 0.3 0.4	4.0 0.7 0.7
National family health survey[39]		1998-1999	15-49	-	2.3
Mohan et al[68]	Chennai urban population study	2001	>20	22.8 21.5	31.8 36.5
Deshmukh et al[21]	Rural wardha	2006	>18	5.1 7.6	5.2 8.7

Definition of Obesity

"Obesity may be defined as an abnormal growth of the adipose tissue due to enlargement of fat cell or increase in fat cell number or both[43]". A number of systems have been used to define and classify obesity.[1a]

Assessment of Obesity

Although obesity can be easily identified at first sight, a precise assessment requires measurement and reference standards. Various methods[49] to assess the obesity are as follows.

Body Weight:

Body weight though not an accurate measure of examining fat, is a widely used index. The various indices used are:

1. Body mass index - BMI (Quetelet's Index)

$$\frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

2. Ponderal Index

$$\frac{\text{Height (cms)}}{\text{Cube root of body weight (kg)}}$$

3. Broca's Index

Height (cm) -100

4. Lorentz's Formula

$$\text{Height (cm) -100} - \frac{\text{Height (cm) -150}}{\text{2 (Women) or 4 (men)}}$$

OTHER METHODS

Skin fold thickness[50]

Waist circumference and Waist: hip ratio[99]

USE OFBODY MASS INDEX (BMI) TO CLASSIFY OBESITY

BMI is a simple index of weight for height that is commonly used to identify underweight, overweight and obesity in adults.

"It is defined as weight in kgs divided by the square of the height in meters (kg/ m^2)"[1a].

The classification is as follows according to WHO and National Heart Lung and Blood Institute (1998)[74].

CATEGORY	**BMI**
Under Weight	<18.5 (kg/m^2)
Normal Weight	18.5 – 24.99 (kg/m^2)
Over Weight	25-29.99 (kg/m^2)

Obese	≥30 (kg/m^2)

It is believed to be a superior measure of adiposity than weight for height, but it too has limitations, that it does not incorporate a direct measure of body fat composition and distribution.

According to Freedman and Colleagues 2002[33] obesity is further classified as:

CATEGORY	BMI
Class I (Moderate obesity)	30-34.9 (kg/m^2)
Class II (Severe obesity)	35-39.9 (kg/m^2)
Class III (Very severe obesity)	≥40 (kg/m^2)

EPIDEMIOLOGICAL FACTORS

The etiology of obesity is complex and is one of multiple causation.

Age:

Obesity can occur at any age but generally increase with age.

Childhood obesity:

Infants with excessive weight gain have an increased incidence of obesity in later life. One third of obese adults have been so since childhood[43].

Sex:

Women generally have higher rate of obesity than men, although men have higher rate of overweight[31].

Pregnancy and Parity:

It has been claimed that women's BMI increases with successive pregnancy. The evidence suggested that this increase is likely to be about 1kg / pregnancy. Hence multiparous women are obese when compared to nulliparous women[74].

Genetic Factors:

There is a genetic component in the etiology of obesity[28].

Physical Inactivity:

Sedentary life style particularly sedentary occupation and inactive recreation promote it. Physical inactivity may cause obesity which in turn restricts activity. This is a vicious cycle[13,28,99].

Socio Economic Status:

Inverse relationship between socio economic status and obesity exist[1a].

Eating Habits:

Eating in between meals, preference in sweets, refined foods and fats composition of the diet, periodicity with which it is eaten and the energy derived from it are all

relevant to the etiology of obesity[76].

Psychosocial Factors:

Psychosocial factors are deeply involved in the etiology of obesity. Overeating may be a symptom of depression, anxiety, frustration[1a].

Familial Tendency:

Obesity frequently runs in families[1a].

Endocrine Factors:

These factors may be involved in occasional cases.

Eg. Cushing's syndrome, growth hormone deficiency, hypothyroidism[1a].

Alcohol:

The relationship between alcohol and adiposity is positive for men and negative for women[100].

Education:

In affluent countries, inverse relationship between education and prevalence of

obesity is seen[100].

Smoking:

Use of tobacco is reported to lower body weight[1a]

Ethnicity:

Ethnic groups in many industrialized countries appear to be especially susceptible to the development of obesity and its complications. This may be due to genetic predisposition[74].

Drugs:

Use of certain drugs e.g. Corticosteroids, Contraceptives, Insulin,
Beta blockers can promote weight gain[74].

HAZARDS OF OBESITY

Metabolic Syndrome:

Obesity interacts with inherited factors and leads to the onset of insulin resistance. This metabolic abnormality in turn is responsible for altered glucose metabolism and a predisposition to type 2 diabetes and cardio vascular diseases and accelerate its course. The most important are type 2 diabetes, dyslipidemia and hypertension[1,74]. Prevalence is increased with age. According to NHANES III, prevalence was about 6% in those with 20years of age, 14% in those with 30-39 years of age, 20% in those with 40-49 years of

age and >30% for women over 50years of age[32].

"20% in reproductive age group[32].

Other Complications:

Obesity cardiomyopathy

Sleep apnea

Ischemic stroke

Gallbladder disease

Sub fertility

Carcinoma endometrium

Deep Vein thrombosis

Poor wound healing

OBESITY IN PREGNANCY:

Definition:

In the past obesity in pregnancy was defined using various approaches.

In an effort to provide guidance on this issue in 1990 the Institute of Medicine (IOM[94]) recommended that, the BMI be used to define maternal weight groups. In 1993 the ACOG released its BMI classification of maternal weight and optimal weight gain during pregnancy. As a result BMI now serves as a standardized means of evaluating the

prevalence and outcomes of obesity during pregnancy[6].

Diagnosis:

For practical purposes, it is useful to keep in AN clinic, acceptable statistical tables which indicates the BMI for various heights and weights. One such calculated BMI values available in graphic form is shown here[3a]

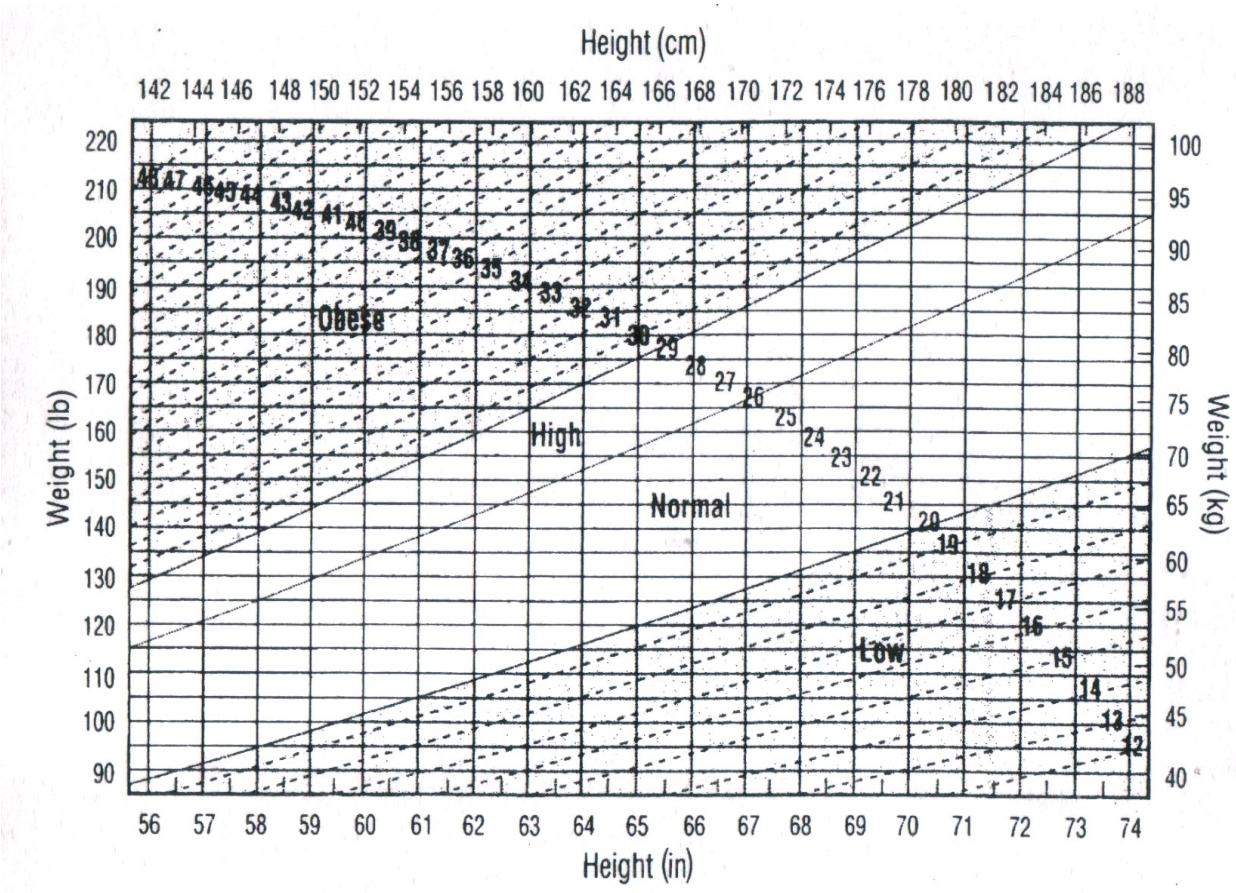


FIGURE 43–1. Chart for estimating body mass index (BMI). To find the BMI category (e.g., obese) for a particular subject, locate the point at which the height and weight intersect. The BMI is the bold number on the dashed line closest to this point. The "High" category is now termed "Overweight."

EFFECT OF OBESITY ON PREGNANCY

ANTEPARTUM COMPLICATIONS

Sub fertility:

When considering the impact of obesity on pregnancy it is first important to note that obesity can be a barrier to reproduction. Several studies have reported an association between BMI and infertility[40,41,83], which in the obese infertile women is mainly due to increased insulin resistance and related to amenorrhea and ovulatory dysfunction[44]. In their review, Neill and Nelson – Piercy 2001[73] linked impaired fecundity in women with BMI >30kg/m^2.

In addition obesity has been associated with an increased risk of spontaneous abortion in patients who receive infertility treatment[10,29,95]. However obesity does not appear to be a risk factor for abortion in spontaneously conceived pregnancy[71].

Pre-Pregnancy Medical Disorders:

Due to their strong association with obesity in the general population essential hypertension and diabetes mellitus are the two most common medical complications of obese gravida[3]. Other obesity associated morbidities such as Coronary heart disease,

stroke and cancer have a low prevalence in the reproductive age group[71].

Obstructive sleep apnea is a rare but serious obesity related morbidity. Data on this complication during pregnancy though limited suggested that obstructive sleep apnea may be precipitated or exacerbated during pregnancy and may be associated with hypertensive disorders during pregnancy and impaired fetal growth[58,61].

Pregnancy Specific Complications:

Gestational Diabetes:

Maternal obesity is associated with an increased risk of gestational diabetes. Incidence varies from 7% to 17%. This increased risk is primarily related to an exaggerated increase in insulin resistance in the obese state[14]. An estimate of the incidence of gestational diabetes in the pregnancies of obese gravidas can be derived from the data of Gross et al[42] and Ehrenberg et al[26]. who each reported a 6.5% and 8.0% incidence of gestational diabetes, respectively in obese gravidas who were from a geographically similar U.S. urban population. In addition, the magnitude of this risk is positively correlated with increase in maternal weight[26,87]. The glucose intolerance associated with gestational diabetes generally resolves after pregnancy. However women who are obese during pregnancy and develop gestational diabetes have been shown to have a 2-fold increased prevalence of subsequent type 2 diabetes as compared to lean women[77]. Therefore maternal obesity is a significant long term risk factor for type 2 diabetes[67].

OBESITY-RELATED PREGNANCY COMPLICATIONS

Author, Year	Medical Complications	Antepartum Complications	Intrapartum Complications	Postpartum Complications	Perinatal Complications
Edwards et al 1978[24]		Hypertensive disorders of pregnancy, Mild Pre-eclampsia, Gestational diabetes, inadequate pregnancy weight gain (<12lb)		Wound episiotomy infection	Birth weight >4kg
Gross et al 1980[42]	Hypertension diabetes mellitus	Gestational diabetes, Multiple gestation, inadequate weight gain	Labor induction Fourth degree laceration		Birth weight >4kg LGA
Calandra et al.1981[13]			Labor Induction	Fever	Birth Weight >4kg
Garbaciak et al 1985[35]	Hypertension diabetes mellitus Thyroid disease syphilis	Pre-eclampsia, Urinary tract infection	Primary cesarean Meconium Late decelerations		
Abrams et al, 1988[3]	Hypertension diabetes mellitus	Pregnancy induced hypertension, Gestational diabetes	Primary cesarean		
Naeye, 1990[70]	Hypertension diabetes mellitus	Preterm birth < 30wks, Twins			Congenital anomaly Perinatal mortality
Perlow et al, 1992[79]	Hypertension diabetes mellitus	Gestational diabetes	Cesarean, primary cesarean		Birth Weight <2.5kg Birth weight >4kg SGA NICU admission
Johnson et al,1992[52]		Postdates	Labor induction, cesarean, Meconium		Birth Weight >4kg
Cnattingius et al 1998[19]	Diabetes mellitus	Gestational diabetes, Pre-eclampsia, Preterm birth <32wks			Late fetal death Early neonatal death.
Bianco et al,1998[11]	Hypertension Diabetes Mellitus Asthma	Pre-eclampsia, Gestational diabetes, Abruption	Meconium, Labor arrest ,Cesarean	Endometritis	LGA
Baeten et al 2001[9]		Gestational diabetes, Pre-eclampsia, Preterm Birth <32wks	Cesarean		Birth weight >4kg Infant death.
Sebire et al, 2001[87]		Gestational diabetes, Pre-eclampsia, Urinary tract infection	Labor induction, Emergency Cesarean	Hemorrhage Genital tract infection Wound infection	LGA Fetal Death Delayed lactation
Lu et al, 2001[64] Ehrenberg et al, 2002[26]	Diabetes Mellitus	Gestational diabetes, Pre-eclampsia, Postterm gestation	Cesarean		LGA Birth weight >4kg Birth weight >4.5kg
Jensen et al, 2003[51]		Postterm gestation, Pre-eclampsia	Labour Induction, Cesarean		LGA, Birth Weight >4kg.

Hypertensive Disorders:

The association between obesity and hypertensive disorders during pregnancy has been a consistent finding in the obstetrical literature[35,51,65,87]. Specifically, maternal weight and BMI have been validated as independent risk factors for pre-eclampsia[90,91]. Sibai et al[90,91] reported a significant difference in the incidence of pre-eclampsia for women with an early second trimester BMI <20 kg/m^2 (4.3%) as compared to when the BMI was ≥ 34 kg/m^2 (12.6% , P < 0.0001). The mechanism by which obesity imparts an increased resistance and subclinical inflammation and endothelial dysfunction are also responsible for the increased incidence of pre-eclampsia in obese gravidas[12,75,104].

Preterm Birth

Conflicting data exist regarding the relationship between maternal obesity and the risk for preterm birth. Naeye[70], in an analysis of data from the Colloborative Perinatal Study undertaken from 1959 through 1966, reported an increasing incidence of preterm birth between 24 to 34 weeks gestation associated with increasing maternal pregravid body weight. The increased incidence of preterm birth was attributed to an increased prevalence of chorioamnionitis and twin gestations in the higher maternal weight groups. In a more recent population based cohort analysis of Washington state birth certificates, Baeten et al[9] reported an increased risk for preterm birth ≤ 32 weeks for women with a pre-pregnancy

BMI ≥ 30 kg/m^2, which remained significant when women without antenatal

complications were analyzed separately (Odd's Ratio = 1.5).

In contrast, in a larger population-based cohort study from Sweden, Cnattingius et al[19] reported an overall increased risk for preterm birth ≤ 32 weeks in nulliparas with a BMI ≥ 30 kg/m^2 (or 1.6:95% CI 1.1-2.3), but this risk was no longer significant when women with hypertensive disease were excluded. Similarly, in a large population-based cohort study from England, Sebire et al[87] reported no association between BMI and preterm birth ≤ 32 weeks when analyses were adjusted for antepartum complications. These data suggest that the increased risk of preterm birth in obese gravidas is primarily associated with obesity related medical and antenatal complications and not some intrinsic predisposition to spontaneous preterm birth.

Prolonged Pregnancy:

There is a growing body of evidence to support the association between obesity and prolonged pregnancy. Although early reports by Calandra et al[13] and Gross et al[42] failed to identify an association between maternal obesity and the incidence of post term (≥42 weeks) pregnancy, Johnson et al[52] subsequently reported an independent association between increasing maternal prepregnancy weight and BMI and the risk for postterm pregnancy. More recently in 2 large cohort studies. Ehrenberg et al[26] reported an increased risk for prolonged pregnancy among obese gravidas (Odd's Ratio 1.5) as did Sebire et al[87] (Odd's Ratio1.72).

Multifetal Gestation

An increased incidence of multifetal gestation has been reported among obese gravidas. (Gross et al[42], Naeye[70])

Urinary Tract Infection

In a pooled analysis of 3 studies,[2,24,35] Abrams et al[2] reported that being over weight prior to pregnancy was associated with a 42% increased risk for urinary tract infections. Its findings have been substantiated by Sebire et al[87].

Others

There is no evidence to support an increased risk of abruptio placentae or placenta previa. (Wolfe HM, et al[103] 1994). But results of other studies (Bainco et al[11], 1998) are conflicting.

Ultrasound in Obese Pregnant Mothers

Obesity can limit the prenatal diagnosis of congenital malformations. Wolfe et al[103] studied the relationship between BMI and the visualization of fetal anatomy. Although obesity poses a significant challenge to the obstetrical sonographer in the diagnosis of fetal malformations, it does not seem to hinder sonographic estimations of fetal weight [31,105].

Practical Difficulties:

1. Clinical diagnosis of pregnancy is sometimes difficult
2. As pregnancy proceeds it is difficult to evaluate size of the uterus, weight of the fetus, to determine the presenting part, to detect fetal heart sound, presence or absence of hydramnios.
3. Maternal Blood Pressure is difficult to determine using standard cuff and may show artificially high blood pressure[75].
4. Difficulty in sonographic visualization in women (Wolfe et al 1990).
5. Cephalo pelvic relationships are difficult to estimate in obese women but potential risk is always present, particularly as multiparity and increased lordosis caused by obesity are both predeterminants of spondylolisthesis.
6. Dyspnea due to exertion.
7. Placing of intravenous lines may be difficult.
8. Difficulty in monitoring maternal and fetal well being can occur.

Intrapartum Complications

Labour Induction:

Understanding of the relationships between obesity and labour characteristics is evolving. Obese gravidas were known to have an increased incidence of labour induction[13,25,27,42]. Estimates of the magnitude of this risk range

from a 1.7 fold to 2.2 fold increase which remains significant even after adjustment for

associated antepartum complications[51,52,87].

Dysfunctional Labour

Investigations on the labour characteristics of the obese gravidas are limited and conflicting. Gross et al[42] found no difference in the major dysfunctional labour patterns between obese and non obese parturients. Ekblad et al[30] also found no difference in the duration of the first and second stage of labour between obese parturients or those with excessive weight gain and controls. However Johnson et al[52] reported a higher risk for labour abnormalities with both increasing prepregnancy BMI and gestational weight gain.

Cesarean Delivery:

The primary intrapartum complication of obesity is an increased risk for cesarean delivery. Both pre-pregnancy obesity[20,55] and excessive maternal weight gain contribute to an increased cesarean risk. Importantly these associations appear to be independent of obesity related antenatal complications, short maternal stature, higher infant birth weights, and gestational age at delivery[53,55,105,106]. The factors that contribute to obesity related increased cesarean risks are not clear. In a large population based cohort study of nulliparas conducted in Sweden, Cnattingius et al[19] demonstrated that cesarean rates increased consistently with decreasing maternal height and increasing prepregnancy BMI. Subsequently,

Young et al[106] reported that among a large cohort of nulliparous women the obesity related increase in cesarean was primarily mediated through an increase in cesarean for

cephalopelvic disproportion, failure to progress, which was independent of maternal height. As previously discussed, there is a lack of consistent evidence to support a higher incidence of specific dysfunctional labour patterns among obese parturients. These preliminary data therefore suggest that obesity may lead to dystocia due to increased soft tissue deposition of the pelvis.

Intraoperative Complications

Cesarean in the obese gravida is more often performed emergently and is associated with prolonged incision to delivery interval, blood loss >1000ml, longer operative times[18,24,78,87] and difficulty in delivering the baby.

Skin Incision

Pfannenstiel incisions are believed to provide a more secure wound closure and less postoperative pain which can lead to early ambulation and improved respiratory function[78,102].

Anesthetic Complication

Increased subcutaneous fat increases the difficulty in placing regional anesthesia and increases the rate of placement failure and thus the need for general

anesthesia[8]. Ranta et al[81] reported that obese parturient experience more technical problems in establishing epidural anaesthesia, such as inadvertent dural puncture, multiple attempts at placement and senior anesthetist consultation, but experienced an

equal response to pain treatment. The greater incidence of medical and antenatal complications, increased risk of cesarean section and higher incidence of anesthetic complications necessitates timely anesthetic evaluation in all obese parturient.

Others

Investigations that controlled for birth weight, the incidence of intrapartum complications such as shoulder dystocia, malpresentation, hemorrhage, and 4th degree laceration did not appear to increase in obese gravida[11,13,24,51]. However because maternal obesity is a risk factor for fetal macrosomia, the clinician should still anticipate these complications. An increased incidence of intrapartum fetal heart rate abnormalities, cord accidents and meconium stained amniotic fluid has been associated with maternal obesity[35,52].

Wound complications:

Obese women have increased rates of wound infection and wound dehiscence. Myles et al[69] found that obesity was an independent risk factor for post cesarean morbidity in women.

Postpartum Complications:

Whether delivered vaginally or by cesarean the obese gravida is at higher risk of postpartum endomyometritis, laceration/episiotomy infection and wound infection[11,24,78,87]. Several studies reported a lack of association between postpartum

hemorrhage and maternal obesity.

Lactation dysfunction may be another postpartum complication of obesity. Study results are conflicting[16,61,82,85].

The cumulative effect of obesity related complications during the postpartum period is a resultant prolongation of hospitalization[47,78].

Prolonged hospitalization for the obese gravida ultimately translates into increased health care costs[34,47].

Perinatal Outcome

Birth weight:

Pre-pregnancy obesity and maternal weight gain both play an important role in determining infant birth weight. Also gestational diabetes is complicated by excessive numbers of large for gestational age and macrosomic infants. As a result the obese gravida is at increased risk of delivering a high birth weight infant[13,24,26,42,52,64].

Anomalies:

There has been an accumulation of evidence to support that maternal obesity is associated with an increased risk of congenital malformations. Watkins et al[96] found that the offspring of obese women have 2-fold increased risk for neural tube defects.

Other malformations are heart defects, ventral wall defects and orofacial defects[80,89,97].

Morbidity and Mortality:

Two important and interrelated co-factors that contribute to excessive perinatal morbidity and mortality are chronic hypertension and diabetes mellitus, both of which are associated with obesity. Chronic hypertension is a well known cause of fetal growth restriction. Pre-gestational diabetes increases the rate of birth defects. The obesity related preterm birth accounted for nearly half of the mortality.

More recent studies also suggested that obesity is associated with an increased risk of still birth – 1.4 to 2.6 fold increased risk for fetal death[9,55,87].

A final outcome to consider is the potential impact of maternal obesity and weight gain on subsequent childhood obesity[57,92,98].

Contraception:

Oral contraceptive pill failure is more likely in overweight women. According to Holt and Colleagues 2002[46] women in the highest weight quartile had sixteen- fold increased risk of pregnancy. Women who used very low dose OCP had 4-5 fold increase in pregnancy rate[43].

Long Term Consequences:

It is intuitive that excessive prepregnancy weight can be used to predict long term obesity with its attendant morbidity and mortality. Rooney and Schauberger[86] 2002 however, reported the excess weight gain during pregnancy but not pre-pregnancy - is a predictor of long term obesity.

AIM OF THE STUDY

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The aim of this study is to evaluate the effect of obesity on the maternal and perinatal outcome in pregnancies complicated by obesity.

MATERIALS AND METHODS

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Study Design: Prospective Cohort Study

Period of Study: July 2005 – June 2006

Place of Study: Institute of Obstetrics and Gynecology, Egmore, Chennai.

Case Selection

Among antenatal mothers attending antenatal outpatient department, mothers were chosen in their first trimester who had Body Mass Index ≥ 30kg /m^2 as study group and mothers with a Body Mass Index between 18.5 kg/m^2 and 25kg/m^2 as control group.

Inclusion Criteria

1. Pregnant women with first trimester BMI ≥30kg/m^2.
2. Pregnant women with first trimester BMI between 18.5kg/m^2 and 25kg/m^2.
3. Irrespective of age, parity, socio-economic status.

Exclusion Criteria

1. Mothers not booked at First Trimester
2. Miscarriage
3. Anomalous baby
4. Women with BMI between 25.1kg/m^2 and 29.9kg/m^2.
5. Women with BMI <18.5kg/m^2.
6. Women who could not be followed until delivery

Method of Study

Pregnant mothers were selected according to the criteria and in all women detailed history followed by complete general and physical examination was done. Relevant hematological, biochemical investigations, USG were done. They were followed up to delivery and postpartum until discharge and outcome studied.

History

In these women relevant history such as age, parity, socioeconomic status, menstrual history, infertility, hypertension, diabetes, hypothyroidism, or other medical illnesses. History of previous pregnancy outcome was obtained in detail. Family history of obesity, hypertension and diabetes, were enquired.

Physical Examination

Detailed physical examination with regards to weight gain, pulse, BP were recorded. They were examined for anaemia, pedal edema and systemic examination of Cardiovascular System, Respiratory System and Central Nervous System was done.

LAB INVESTIGATION

Relevant investigations were done in each case.

Follow-up of Cases

With above information, the antenatal mothers were followed up during antenatal period, delivery and postpartum until discharge. They were looked for
the development of :

Gestational diabetes mellitus

Pre-eclampsia

Gestational hypertension

Malpresentation

Multiple pregnancy

Abruptio placenta

Placenta previa

Labour induction and their indication

Mode of delivery (Vaginal / Cesarean delivery)

Shoulder dystocia

Instrumental delivery

Postpartum hemorrhage

Deep vein thrombosis

Postoperative wound infection

Postoperative wound dehiscence

Duration of hospital stay

Neonates

- Gestational age at birth
- Birth weight
- Apgar at 5 minutes
- Admission in NICU and indications for admission were analysed

Statistical Analysis:

Differences between groups were evaluated using chi- square and student t test and statistical significance was deemed at a p value of < 0.05. Odd's ratio was calculated expressing the relationship between obesity group and specific maternal outcomes.

DATA ANALYSIS

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One Hundred and Five pregnant women with BMI $\geq$ 30kg/m^2 and Two Hundred and Ten pregnant women with BMI 18.5kg/m^2 to 25kg/m^2 were selected and were followed prospectively. Six Obese women were excluded from the study, as four women had miscarriage, one lost for follow-up and one had anomalous baby. Nine women with

normal BMI were excluded from the study, as five women had miscarriages, three lost for follow-up and one had anomalous baby. The remaining ninety nine obese women and two hundred and one women with normal BMI were studied.

MATERNAL AGE DISTRIBUTION:

AGE (YEARS)	Control		Obese	
	No	Percentage	No	Percentage
<20	13	6.47%	1	1.01%
20-24	114	56.72%	29	29.29%
25-29	56	27.86%	41	41.41%
≥ 30	18	8.96%	28	28.28%

P <0.05 (Significant)

The majority of obese women (41.41%) were between 25-29yrs where as majority of control women (56.72%) were between 20-24yrs. Proportion of women in the age group ≥30yrs were 28.28% in obese group and only 8.96% in control group. This difference in age group distribution was statistically significant.

AGE IN YEARS

Group	Total	Mean Years	Standard Deviation	Student t-test
Control	201	24.14	3.424	T=6.12 P=0.001
Obese	99	27.01	4.525	

The mean age in obese group was 27.01years where as in control group it was 24.14 years (P= 0.001). Obese women tend to be older.

MATERNAL WEIGHT

	Group	Total	Mean (kg)	Standard Deviation	Student –t Test
Wt at Booking	Control Obese	201 99	51.25 76.73	4.682 9.065	T=32.1 P=0.001
BMI at	Control	201	21.70.35	1.70879	T=43.3

Booking	Obese	99	32.7313	2.66237	P=0.001
Wt at delivery	Control Obese	201 99	61.33 83.94	5.602 9.056	T=26.6 P=0.001

The mean weight at booking in obese women was 76.73kg and in control women, it was 51.25kg. The mean BMI at booking in obese women was 32.7313kg/m^2 and in control women it was 21.7035 kg/m^2. The mean weight at term in obese women was 83.94kg and in control women it was 61.33kg.

SOCIOECONOMIC STATUS

Socioeconomic Class	Control		Obese	
	No	Percentage	No	Percentage
I	-	-	-	-

II	2	1%	1	1.01%
III	12	5.97%	12	12.12%
IV	63	31.34%	37	37.37%
V	124	61.69%	49	49.49%

X^2=5.61, P>0.05 Not significant

Most of the women in obese and control groups belonged to Class V.

CATEGORISATION OF OBESE WOMEN

BMI kg/m^2	**Category**	**Numbers**	**Percentage**

30-34.9	Moderate Obesity	82	82.82%
35-39.9	Severe Obesity	12	12.12%
≥ 40	Very Severe Obesity	5	5.56%

In the study group 82.82% were moderately obese, 12% were severely obese and only 5.56% were very severely obese.

PARITY

Parity	Control		Obese	
	No	Percentage	No	Percentage

Nulliparous	92	45.77%	36	36.36%
Para I	101	50.25%	54	54.54%
Para II	8	3.98%	9	9.09%

X^2=11.02, P=0.02 (Significant)

Among obese women 36.36% were nulliparous and 63.63% were parous women, where as in control group 45.77% were nulliparous and 54.23% were parous women.

MEAN BMI IN OBESE POPULATION IN RELATION TO PARITY

Parity	Mean BMI (kg/m^2)
Nulliparous	32.09
Para I	32.87
Para II	34.38

As parity increased the mean BMI increased among obese women.

MENSTRUAL PATTERN

Menstrual Pattern	Control		Obese	
	No	Percentage	No	Percentage
Regular	196	97.51%	81	81.82%

Irregular	5	2.49%	18	18.18%

X^2=22.7 p=0.001 (Significant)

18.18% of obese women had irregular menstrual pattern where as only 2.49% of control women had irregular menstrual pattern.

INFERTILITY

Infertility	**Control(201)**		**Obese(99)**	
	No	Percentage	No	Percentage
Yes	5	2.49%	20	20.20%
No	196	97.51%	79	79.80%

X^2=27.3, P=0.001 (Significant)

In obese women 20.20% had infertility where as in control women it was 2.49%.

PREPREGNANCY MEDICAL DISORDERS

Medical Disorders	**Control**		**Obese**	
	No	Percentage	No	Percentage

Diabetes	0	-	2	2.02%
Hypertension	1	0.5%	2	2.02%
Hypothyroidism	4	1.99%	10	10.1%
Asthma	1	0.5%	0	-
Epilepsy	2	1%	1	1.01%
Heart disease	1	0.5%	0	-

Two were diabetic in obese group, where as none were so in control group. Two Obese women were hypertensive, where as none were so in control group. These were not statistically significant as were other disorders namely asthma, epilepsy and heart disease. 10 obese women (10.10%) were hypothyroid, but in control only four were so (1.99%). This difference was statistically significant (P=0.001).

PREGNANCY RELATED MEDICAL DISORDERS

Complications	**Control**		**Obese**		**Test of Significance**	**Odds Ratio**
	No	Percentage	No	Percentage		

Gestational Diabetes Mellitus	4	1.99%	10	10.1%	P <0.05	5.53
Preeclampsia	12	5.97%	13	13.13%	P <0.05	2.38
Gestational Hypertension	6	2.99%	10	10.10%	P <0.05	3.65

The incidence of gestational diabetes was 10.1% and 1.99% respectively in obese and control group. The incidence of pre-eclampsia was 13.13% and 5.97% in obese and control group respectively. The incidence of gestational hypertension was 10.1% and 2.99% in obese and control group respectively. The results were statistically significant.

OTHER OBSTETRIC COMPLICATIONS

Complications	**Control**		**Obese**	
	No	**Percentage**	**No**	**Percentage**

Multiple pregnancy	2	1%	1	1.01%
Abruptio placenta	1	0.5%	1	1.01%
Placenta previa	1	0.5%	1	1.01%
Malpresentation Breech Face	8	3.98%	 5 1	 5% 1.01%

P >0.05 (Not – Significant)

Obstetric complications like multiple pregnancy, placenta previa, abruptio placenta and malpresentation existed in both groups, but the difference was not statistically significant.

INDUCTION OF LABOUR

Induction	Control		Obese	
	No	**Percentage**	**No**	**Percentage**
Yes	10	4.98%	12	12.1%
No	191	95.02%	87	87.9%

$X^2 = 3.84$, P=0.05, Odd's Ratio: 2.55

The labour induction rates were 12.1% and 4.9% in obese and control group respectively. The rates were higher in obese group and the difference was statistically significant. Obese women had 2.5 times increased risk of being induced than control women.

INDICATIONS FOR LABOUR INDUCTION

Indication	Control		Obese	
	No	Percentage	No	Percentage
Gestational hypertension	-		3	25%
Pre-eclampsia	3	30%	4	33.33%
Pre-eclampsia with IUGR	-		1	8.33%
Post datism	4	40%	3	25%
PROM	1	10%	-	
PPROM	1	10%	1	8.33%
Oligohydramnios	1	10%	1	

In obese group the majority of induction of labour was done for hypertensive disorders of pregnancy (66.66%). Post datism was the major reason for induction in control group (40%).

MODE OF DELIVERY

MODE OF DELIVERY	CONTROL		OBESE	
	No	**Percentage**	**No**	**Percentage**
Labour natural	133	66.17%	41	41.41%
Primary cesarean delivery	28	13.93%	25	25.25%
Repeat cesarean delivery	33	16.42%	31	31.31%
Forceps delivery	4	1.99%	1	1.01%
Assisted breech delivery	1	0.5%	-	-
VBAC	2	1%	1	1.01%

X^2=19.51, P=0.001, Significant

The labour natural was lower in obese group (41.41%) when compared to control group (66.17%). The primary cesarean delivery rates were higher in obese group (25.25%), when compared to control group (13.93%). The instrumental delivery rates and VBAC rates were 1.01% and 1% in obese group and 1.99% and 1% in control group respectively and were almost equal in both groups.

CESAREAN DELIVERY RATES

Mode of Delivery	Control	Obese			
		MODERATE	SEVERE	VERY SEVERE	TOTAL
Vaginal Delivery	140 (69.65%)	38 (46.34%)	4 (33.33%)	1 (20%)	43 (43.43%)
Cesarean Delivery	61 (30.35%)	44 (53.66%)	8 (66.67%)	4 (80%)	56 (56.57%)

X^2=19.16, P=0.001, Odd's Ratio: 2.98

The Cesarean delivery rates were higher in obese group (56.57%) than control group (30.35%). Obese women had 2.8 fold increased risk of cesarean delivery than non obese women. The rates increased with severity of obesity.

PRIMARY CESAREAN DELIVERY

	Control		Obese		Odd's Ratio
	No	**Percentage**	**No**	**Percentage**	
Emergency	24	17.64%	21	31.34%	2.13
Elective	4	2.94%	4	5.97%	2.06
Total	28	20.58%	25	37.31%	2.29

The primary Cesarean delivery rates were 37.31% in obese group and 20.58% in control group. Obese women had 2.29 times increased risk for cesarean delivery than control group. Obese women had higher risk of emergency cesarean delivery (31.34% Odd's ratio: 2.13) than control group (17.64%). Similarly obese women had increased risk of elective cesarean delivery (5.97%, Odd's Ratio: 2.09) than control group (2.94%).

INDICATIONS FOR PRIMARY EMERGENCY CESAREAN DELIVERY

Indications	Control		Obese	
	No	Percentage	No	Percentage
Cephalo Pelvic Disproportion	5	20.83%	5	23.8%
Failure to progress	3	12.5%	2	9.52%
Fetal Distress	6	25%	6	28.57%
Failed Induction	4	16.67%	4	19.04%
Malpresentation	4	16.67%	2	9.52%
Imminent eclampsia	-	-	1	4.76%
Placenta previa	-	-	1	4.76%
Failed forceps	1	4.17%	-	-
Deep transverse arrest	1	4.17%	-	-

The major reasons for emergency cesarean delivery were fetal distress, cephalo pelvic disproportion and failed induction in both groups.

MODE OF DELIVERY ACCORDING TO PARITY

	CONTROL			OBESE		
Mode of Delivery	**Nulliparous (92)**	**Previous Normal Delivery (74)**	**Previous Cesarean Delivery (35)**	**Nulliparous (36)**	**Previous Normal Delivery (31)**	**Previous Cesarean Delivery (32)**
Vaginal Delivery	70 (76.09%)	68 (91.89%)	2 (5.71%)	20 (55.26%)	22 (70.97%)	1 (3.12%)
Cesarean Delivery	22 (23.91%)	6 (8.11%)	33 (94.29%)	16 (44.44%)	9 (29.03%)	31 (96.88%)

In nulliparous women, caesarean delivery was higher in obese group (44.44%) when compared to control group (23.91%) (P=0.01 significant, Odd's Ratio: 2.55). Obese nulliparous women had 2.5 fold increased risk for cesarean delivery. Similarly in parous women with previous normal delivery, cesarean delivery was higher in obese group (29.03%) than control group (8.11%) (P=0.01 significant). The repeat caesarean rate was almost similar in both groups.

INTRAPARTUM COMPLICATIONS

Complications	Control	Obese
Shoulder dystocia	-	-
Complete perineal tear	-	-
Hemorrhage	1	1

No shoulder dystocia or complete perineal tear was seen in either group. There was one case of atonic hemorrhage in each group.

POSTPARTUM COMPLICATIONS

Complications	Control		Obese		Odd's Ratio
	No	Percentage	No	Percentage	
Wound Infection	6	(9.84%)	13	(23.21%)	2.77
Wound Dehiscence	1	(1.67%)	5	(8.93%)	3.12
Deep Vein Thrombosis	-		-		-

P<0.05 Significant.

Wound infection and dehiscence rates were higher in obese group (23.21% and 8.93%) than control group (9.84% and 1.67%) respectively. Obese group

had 2.47 fold and 3.12 fold increased risk for wound infection and dehiscence respectively than control group. Postpartum deep vein thrombosis was not seen in either group.

GESTATIONAL AGE AT DELIVERY

Gestational Age (Weeks)	Control		Obese	
	No	Percentage	No	Percentage
>37	196	97.5%	95	95.96%
35-37.6	3	1.49%	2	2.22%
32-34.6	2	1%	2	2.22%

X^2=0.65 P=0.72 Not Significant

95.96% of obese women and 97.5% of control women delivered at term and 4.22% of obese women and 2.49% of control group delivered preterm. The difference was not statistically significant.

BIRTH WEIGHT OF THE NEONATE

Birth Weight (kg)	Control		Obese	
	No	Percentage	No	Percentage
1.5-1.99	1	0.49%	2	2%
2.0-2.49	8	3.94%	2	2%
2.5-2.99	98	48.28%	27	27%
3.0-3.49	78	38.42%	44	44%
3.5-3.99	18	8.87%	22	22%
≥4	-	-	3	3%
TOTAL	203		100	

P<0.05 Significant

Majority of the neonates of obese women (44%) were between

3kg-3.49kg and of control women (48.28%) were between 2.5kg – 2.99kg. 22% babies of obese women were between 3.5kg-3.99kg when compared to 8.87% babies of control women. 3 babies were ≥4kg in obese women but none in control group.

MEAN BIRTH WEIGHT OF THE NEONATE

	Numbers	**Mean (kg)**	**Standard Deviation**	**Student –t Test**
Control	203	2.92	0.323	T=4.80 P=0.001
Obese	100	3.16	0.442	

The mean birth weight of the neonate was 3.16kg in obese group and 2.92kg in Control group.

APGAR AT 5 MINUTES

Apgar at 5min	**Control**		**Obese**	
	No	Percentage	No	Percentage
<7	3	1.48%	3	3%
≥ 7	200	98.52%	97	97%

Total	203		100	

The difference of Apgar at 5minutes between obese and control group was not statistically significant (P>0.05).

NICU ADMISSIONS AND THEIR INDICATIONS

Indication	Control		Obese	
	No	Percentage	No	Percentage
Meconium Aspiration	5	29.4%	3	14.28%
Asphyxia	1	5.8%	-	-
Transient Tachypnia of New born	2	11.76%	-	-
Infant of Diabetic mother with RDS	-	-	2	9.5%
Infant of Diabetic Mother	4	23.53%	8	38.09%
Preterm	4	23.53%	4	19.05%
IUGR	1	5.8%	1	4.76%
Abnormality	-	-	2	9.52%
Macrosomia	-	-	2	9.52%

Total	17	8.37%	21	21%

21% of babies born to obese women and 8.37% babies of control women were admitted in NICU. (P <0.05). The major reason for admission of babies of obese women was for the care of infants of diabetic mother and in control group the reason was meconium aspiration.

HOSPITAL STAY

	Hospital Stay	**Control**		**Obese**		**P value**
		No	**Percentage**	**No**	**Percentage**	
Vaginal Delivery	2 days	125	89.29%	32	74.42%	<0.05
	> 2days	15	10.71%	11	25.58%	
Cesarean Delivery	7 days	54	88.52%	41	73.21%	<0.05
	>7 days	7	11.48%	15	26.79%	

Among vaginal delivery group 25.58% of obese women and 10.71% of control women required prolonged hospital stay (>2days) and in cesarean delivery group

26.79% of obese women and 11.48% of control women required prolonged hospital stay (>7days).

DISCUSSION

DISCUSSION

In our study, women in the obese group were slightly older when compared to women with normal BMI. The mean maternal age in obese group was 27.01yrs. Obese women were less likely to be nulliparous. Mean BMI in obese group increased with parity. This is in accordance with the results of Ehrenberg HM et al 2002[26]that, increasing age and parity are risk factors for obesity.

We observed that obese women had increased menstrual abnormalities and infertility when compared to women with normal BMI. This is consistent with studies done by Hartz AZ et al 1979[44] and Neil and Nelson 2001[73] that, obese women have menstrual abnormalities related to ovulatory dysfunction and insulin resistance leading to infertility.

Previous studies show that obese women have increased incidence of preexisting

diabetes and chronic hypertension, complicating pregnancy. (Perlow et al 1992[79], Garbaciak 1985[35]). But our study failed to show such association, which may be due to the small size of the sample. Obese women had increased incidence of hypothyroidism (10%), in accordance with Garbaciak et al 1985[35].

In obese group, we found increased risk of pre-eclampsia (13.13%). The frequency was almost 2.3 times as high for obese group as it was for group with normal BMI.

Obese women were observed to have an increased incidence of gestational hypertension (10.1%) when compared with control group (2.99%). The risk of gestational hypertension among obese women was increased almost 3.6 fold.

In our population, obese group exhibited a higher risk of developing gestational diabetes (10.1 %,) when compared to normal BMI group (1.99%). There was 5.53 fold risk increase for gestational diabetes among obese women.

Our study results were consistent with several studies:

Gestational diabetes	Our study	10.1%
	Gross et al (1980)[42]	6.5%
	Ehren Berg et al 2002[26]	8%
	Glady et al 2005[36]	8%
	Glady et al 2005[36]	14% (Asians)
Pre-eclampsia	Our sudy	13.13%

	Sibai et al 1995[90] Heather E. Robinson et al 2005.[45] Glady et al 2005[36] Glady et al 2005[36]	12.6% 18.9% - 22.6% 16% 13% (Asian)
Gestational Hypertension	Our study Joshua .L. Weiss et al 2004[53]	10.1% 10.2%

In our study, placental abnormalities such as placenta previa and placental abruption occurred equally among obese women and normal weight women. Bainco et al[11] showed an increased incidence of abruption, but results of Wolf HM et al 1994[10] including ours did not show association.

There was no significant association with multiple pregnancy and BMI in our study, which occurred equally in obese group (1.0%) and control group (1%). This is consistent with study done by Marie. I Cedergren[65]. But other studies have reported, increased incidence of multiple pregnancy. (Gross T. et al, 1980[42], Naeye RL, 1990[70])

We observed that labour induction was more common in obese group(12.1%) when compared to control group(4.9%), which is in accordance with other studies, (Ekblad U et al 1992[27]). The risk of induction among the obese women was increased almost 2.5 fold. Cedergren et al, 2004[65] in his study had an incidence ranging from 13.1% -18.3% according to the severity of obesity. In our study, the major reason for the induction was hypertensive disorders of pregnancy (66.6%) in obese group.

In the obese group, our results supported a number of previous studies (Joshua-L-Weiss et al 2001[53] and Marie -I - Cedergren 2004[65]) that have demonstrated an increased risk for cesarean delivery in this group.

The cesarean delivery rates were 56.57% in obese group and 30.35% in control group. Obese women had 2.8 fold increased risk of cesarean delivery when compared to control group. The risk increased with the severity of obesity. The primary caesarean delivery rates were higher among obese group (25.5%) when compared to control group (13.93%). The caesarean delivery rates were higher among nulliparous obese group and even, obese women with previous normal delivery had higher risk for caesarean delivery. Obese nulliparous women had 2.5 fold increased risk of cesarean delivery than lean women. We also found that, both emergency and elective primary cesarean deliveries were increased in obese group. We found no difference in repeat cesarean delivery rates between two groups.

Instrumental deliveries were surprisingly not increased in obese group, which is in contrast to other studies (Joshua. L. Weiss et al, 2001[53], Marie. I Cedergren 2004[65].The increased cesarean delivery rates in obese women may explain why we did not find association between instrumental delivery and obesity. But in a large study from London (Sebire NJ, et al 2001[87]), no increased risk of instrumental delivery was seen, among obese women. Complete perineal tear and shoulder dystocia was not seen in either

groups, which may be due to the increased cesarean delivery rates and low instrumental delivery rates.

In accordance with other studies, (Myles et al 2002[69], Wolf HM et al 1998[102]) we found obese women to be at a greater risk of post-operative wound infection and wound dehiscence. Obese women had 2.47 fold and 3.12 fold increased risk for wound infection and dehiscence respectively. Atonic hemorrhage occurred in one woman in each group, and the association was not statistically significant (Jensen et al 2003[51], Bainco et al 1998[11]). This may be due to the active management of third stage of labour and reduced instrumental deliveries.

There are conflicting data in the literature regarding maternal obesity and preterm birth, with some studies (Baeten et al 2001[9]) showing increased risk and some studies showing no change (Sebire et al 2001[87]). In our study, no difference was found between either groups for preterm birth <37wks. The reason for the difference in study results may reflect difference in study population.

In our study, the mean birth weight of the neonates of obese group was 3.16kg and the neonates of control group was 2.92kg. As previously reported, (Ehrenberg et al 2002[26], Sibire et al 2001[87]) obese women had increased risk of delivering high birth weight babies. We found that 25% of obese group delivered babies 3.5kg and above,

when compared to 8.87% of control group.

Neonates of obese mothers had increased NICU admission, the major reasons for admission being infants of diabetic mothers and macrosomia. There was no difference in Apgar score at 5 min between the two groups. This is consistent with study done by Line Rode et al[62].

As documented in previous studies, (Hood et al 1993[47]) the obese women had prolonged hospital stay, which may be due to associated medical complications, wound infection and NICU admission.

SUMMARY

SUMMARY

In our study, 99 obese women (BMI≥30kg/m^2) and 201 women with normal BMI (18.5kg/m^2 – 24.99kg/m^2) were studied. It was observed that:

1. Obese women were slightly older than control group. Majority of obese women belonged to age group 25-29yrs when compared to control group ,who belonged to 20-24years age group.

2. The mean age of obese women was 27.01yrs and that of control women was 24.14yrs.

3. The proportion of nulliparous women was less in obese group (36.36%) when compared to control group (45.77).

4. In obese group, the mean BMI increased with increase in parity.

5. Among obese group, majority (82.82%) was moderately obese, 12.12% were severely obese and 5.56% were very severely obese.

6. 18.18% of obese women had menstrual abnormalities when compared to 2.49% of control women.

7. Infertility was seen in 20.2% of obese group and 2.49% in control group

8. Obese women had increased incidence of pre-existing medical disorders like hypothyroidism, when compared to control group. But no difference was seen with respect to diabetes, hypertension and other morbidities between the two groups.

9. Obese women had increased incidence of gestational diabetes when compared to control group (10.10% Vs 1.99%) . Obese group had 5.53 fold increased risk of gestational diabetes.

10. The incidence of pre -eclampsia was higher in obese group when compared to control group (13.13% Vs 5.97%). Obese women had 2.3 fold increased risk of developing pre-eclampsia.
11. Gestational hypertension was found to be higher in obese group when compared to control group (10.10% Vs 2.99%). The risk of gestational hypertension among obese group was increased almost 3.6 fold.
12. Obese women were more likely to be induced (12.1%, Odd's Ratio: 2.55) when

compared to control group (4.9%).

13. Increased cesarean delivery rates was found among obese women (56.57%, Odd's Ratio 2.8) when compared to control group (30.35%). The risk increased with increase in severity of obesity.
14. Nulliparous women had 2.5 fold increased risk of cesarean delivery when compared to women with normal BMI.
15. Emergency primary cesarean deliveries were higher among obese group (31.34%, Odd's Ratio: 2.13,) when compared to control group (17.64%). Similarly elective primary cesarean delivery was also fond to be higher in obese group (5.97%, Odd's Ratio: 2.09) when compared to control group(2,94%)
16. No difference was seen among obese and control group with respect to placenta previa, abruptio placenta, malpresentation, multiple pregnancy, instrumental deliveries, shoulder dystocia, complete perineal tears and hemorrhage.
17. Post operative wound infections and wound dehiscence were found to be increased in obese group (23.2%, 8.93%) when compared to control group (9.84%, 1.67%) respectively(Odd's Ratio: 2.47 and 3.12 respectively).

18. No difference was found in preterm births (<37 weeks) between two groups

19. The majority of the neonates of obese women (44%) were between 3kg-3.49kg where as majority of neonates in control group (48.28%) were between 2.5kg – 2.99kg.

20. Three babies of obese women were ≥4kg but none were in control group.

21. No difference was seen among obese and control group with respect to Apgar score at 5 Minutes. (3% Vs 0.49%) respectively.

22. There were increased admissions to NICU among neonates of obese women (21%) when compared to control group (8.37%). The major reasons for admissions were for the care of infant of diabetic mother and macrosomia.

23. There was one still birth and one early neonatal death in obese group due to prematurity. None were there in control group

Prolonged hospital stay was required in obese group (26.26%) when compared to control group (10.95%). The major reasons for the prolonged stay were due to wound infections, medical disorders and NICU admissions.

CONCLUSION

CONCLUSION

Our study points out the numerous maternal and perinatal risks in obese pregnant women which pose a considerable challenge to the obstetrical practitioner. In addition, massive obesity among women of child bearing age is associated with a number of health risks later in life. This stresses the importance of concentrating on trying to reduce the increasing incidence of obesity in fertile women. The best time of intervention may be before a women considers a pregnancy, because it is not recommended that obese women lose weight during pregnancy.

This implicates the need of pre-pregnancy advice and counseling to young women. Obese women considering pregnancy should be informed of the risk that maternal obesity confers on a pregnancy.

Health care professionals need to encourage and assist obese women to make life style changes, to lose weight pre-conceptually in an attempt to optimize and potentially decrease the risk of complication in pregnancy.

Pregnancies among obese women must be classified as high risk pregnancies and appropriate antenatal care should be provided with heightened surveillance, anticipation and diagnosis of the complications and intervene earlier if complications arise.

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PROFORMA

PROFORMA

Serial No: Date of Admission:

Name: Age:

Husbands Name:

Address:

Occupation:

Socioeconomic Status:

Booking:

Immunisation:

History of present illness:

Menstrual history: Regular / Irregular

LMP:

EDD:

Marital History: Married Since:

Consangunity:

H/o Infertility:

Obesity History: G P L A

Last Child Birth

Previous Obstetric History: Details of Outcome

Personal History: Smoking -

Alcohol -

Diet -

Past Medical History: Diabetes :

Chronic Hypertension :

Heart Disease :

Others :

Drug Intake :

Childhood Obesity :

Past Surgical History:

Present Pregnancy:

I Trimester:

Hyperemisis

Fever

Radiation Exposure

Medications

Pain Abdomen

II Trimester:

Date of quickening

Bleeding PV

GDM

Pre-eclampsia

III Trimester:

Bleeding PV

GDM

Pre eclampsia

GENERAL EXAMINATION

Height at Booking:

Weight at Booking:

BMI at Booking:

Weight at delivery:

Anemia:

Edema:

Pulse: Respiration:

Blood Pressure:

Cardiovascular System:

Respiratory System:

Thyroid:

Breast:

Spine:

Gait:

OBSTETRIC EXAMINATION

Per abdomen

Fundal height

Abdominal girth:

Fundal grip:

Umbilical grip:

I pelvic grip:

II Pelvic grip:

Fetal heart:

Liquor volume:

Estimated fetal weight:

PELVIC EXAMINATION:

Investigations:

Urine: Albumin

Sugar

Culture/Sensitivity

Blood: Hemoglobin:

PCV:

Blood Sugar:

Urea: Others:

S. Creatinine:

Ultra Sound:

ANTEPARTUM COMPLICATION:

Gestational Diabetes:

Pre-eclampsia :

Gestational Hypertension:

Placenta Previa:

Abruptio Placenta:

Malpresentation:

DELIVERY DETAILS:

Induction of Labor: Yes/No

Indication for Induction:

Date of Delivery:

MODE OF DELIVERY:

Labor Natural: VBAC:

Forceps Delivery:

Cesarean delivery: Elective /Emergency

Indication for Cesarean delivery:

INTRAPARTUM COMPLICATIONS:

Shoulder dystocia :

Postpartum hemorrhage:

Complete perineal tear:

Colour of the liquour:

POSTPARTUM COMPLICATIONS:

Wound Infections:

Wound dehiscence:

Deep vein Thrombosis:

Fever:

NEONATE

Live Born: Still Born: Intrauterine death

Apgar: 1 Min 5 Min

Gestational age at delivery:

Birth weight:

Sex of the baby: M F

Congenital Abnormalities:

Admission in NICU:

Reason for admission in NICU:

Neonatal death:

Condition at Discharge:

Date of Discharge:

Duration of Hospital Stay:

Vaginal Delivery: 2 days >2 days

Cesarean Delivery: 7 days >7 days